Experiment 46: Manganese Dioxide Thermite

I wanted manganese metal for my element collection, so I tried a thermite reaction to extract it from manganese dioxide. Really, I just like thermite in general, so any oxides I can get my hands on are susceptible to being reduced. :) To get my manganese dioxide, I removed the black electrolyte sludge from alkaline and dry cell batteries. Then, I washed the paste, dried it in the oven, and ball milled it to a fine powder. I mixed this with some of my ball-milled aluminum powder in a 2.42:1 MnO_2:Al ratio and placed it in a flowerpot for ignition.

https://www.youtube.com/watch?v=asbD_4v0BFo

Ignition was accomplished with a magnesium ribbon, and the reaction proceeded, but not as vigorously as I had expected. Whereas the thermite should have burnt itself out in less than 30 seconds, mine took over two minutes to finish. The slag was a crumbly, dirt-like powder, instead of the molten glass and metal that should have appeared. I thought that my aluminum powder wasn't fine enough, so I ran my ball mill for a longer time and tried again, but the thermite still didn't produce any lumps of manganese metal. However, the slag powder stuck to a magnet, which could indicate that it has metallic manganese or a manganese alloy in the slag.

While I didn't succeed in extracting manganese metal, I certainly got my money's worth of fiery, beautiful thermite! After some online research, it appears that battery paste has a lot of carbon, which would definitely hurt a thermite reaction by throwing off the stoichiometry and absorbing heat. In the future, I may try purifying battery paste or I may use pottery manganese dioxide in my thermite. The third time's the charm!